

**Title: Freaky Frogs****Brief Overview:**

This probability unit involves cooperative learning with the emphasis on predicting, collecting, displaying, and analyzing data. Students will work in cooperative groups investigating the probability of frogs landing on a certain color in a spinner. Culminating/assessment activity consists of a writing prompt in the form of a paragraph.

**Links to NCTM Standards:**

- **Mathematics as Problem Solving**  
Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, problems which are solved in a cooperative atmosphere, and problems which are solved with the use of technology.
- **Mathematics as Communication**  
Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with the language, signs, symbols and terms of the discipline.
- **Mathematics as Reasoning**  
Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.
- **Number Concepts and Relationships**  
Students will demonstrate their ability to apply estimation strategies in problem solving.
- **Statistics**  
Students will demonstrate their ability to collect, organize, and display data and will interpret information obtained from displays. They will write reports based on statistical information.
- **Probability**  
Students will demonstrate the basic concepts of probability, such as predicting and finding probabilities.

**Grade/Level:**

Grades 3 and 4

**Duration/Length:**

3 class days (45 minutes for each session)

**Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Working in a cooperative group
- Working with probability
- Constructing a bar graph
- Working with fractions
- Writing a paragraph

**Objectives:**

Students will:

- be able to understand and communicate the concept of probability.
- be able to make individual predictions.
- be able to interpret a bar graph and come to a conclusion.

**Materials/Resources:**

- 1 spinner with various color combinations per group Resource #1
- 1 Resource Sheet #2 per group to record data.
- 1 large-sized graph paper per group to create bar graph.
- 1 set of crayons or markers per group.
- 1 sheet per student for writing prompt -- Resource #3
- 1 ruler per group

**Development/Procedures:****Day 1:**

- Teacher will prepare spinners with a variety of color combinations. Teachers have the option of taping a small image of a frog to the tip of the arrow on the spinner. There will be one spinner per group, each group consisting of 4-5 students. Using Resource #1 as an example, teachers will create color combinations based on the ability of the students.
- Class will be introduced to the concept of a game at the state fair (See Resource #2). Ask the students to name various games to be found at a fair. Present a small model of a spinner either in the form of an overhead or by walking around the class.

Explain to the students that the frog will have to land on the green area of the spinner at least 25 times out of 50 spins in order to win the prize. Have students examine the different colors and fractions of the presented spinner, and encourage them to predict possible outcomes. The teacher will write down students' predictions. Probabilities will be orally discussed along with reasoning behind the students' predictions.

- Upon completion of this class introduction, the teacher will divide students into groups and distribute 1 spinner per group and Resource #2 to record possible outcomes, make predictions and record data.
- Teacher will explain to students that each group has a different spinner, and they need to keep their spinner color combinations a secret. They will pick a quiet place in the room to work where no students from other groups will be able to see their spinner. Students will write outcomes and predictions on Resource Sheet #2 as a group prior to starting their activity.
- Students will take turns spinning with one student recording the color the frog lands on using in the appropriate space in the tally sheet. Upon completion of the 50 spins, the group will add up the total number of spins for each color.

## **Day 2:**

- Graph paper, crayons, and rulers will be distributed for each group. Using the data from the previous day on Resource #2, each group will work cooperatively to complete a bar graph complete with title and labeled  $x$  and  $y$  axis. The bar graph will be used to organize and display data from yesterday's experiment.
- When each group has completed their bar graph, they will display it within sight of other groups.
- After all groups have displayed their graphs, a class discussion will take place predicting the possible color combinations of the mystery spinners by observing the collected data. Discussion will include how and why the students came to their conclusions.
- After the probability of different colors has been discussed for each graph, the mystery spinner will be revealed to compare predictions and actual outcomes.

If time permits, allow the students the opportunity to discuss how the number of spins would present a more accurate probability. For a homework question, ask the students why they would have a better chance of winning a prize if the contestant was given 100 spins on their group spinner rather than 50.

### **Day 3:**

- Students will be provided with Resource Sheet #3 that will include the introduction of the writing prompt to the state fair. Using the observations of their specific group spinner, students will have the opportunity to explain their knowledge of probability. Prior to beginning the paragraph, the student will mark an “x” on the probability scale at the top of their resource sheet showing the probability of the student winning the prize. Students will write a paragraph to a friend persuading him or her to play the game or not to play the game. Students should use the data collected to support their position.
- If time allows, student will have the opportunity to share their paragraphs amongst their peers.

### **Performance Assessment:**

Assessment will be based on participation in discussion, group graphing activity, probability scale, and writing prompt. Teacher will use rubric, Resource #4, to assess paragraph.

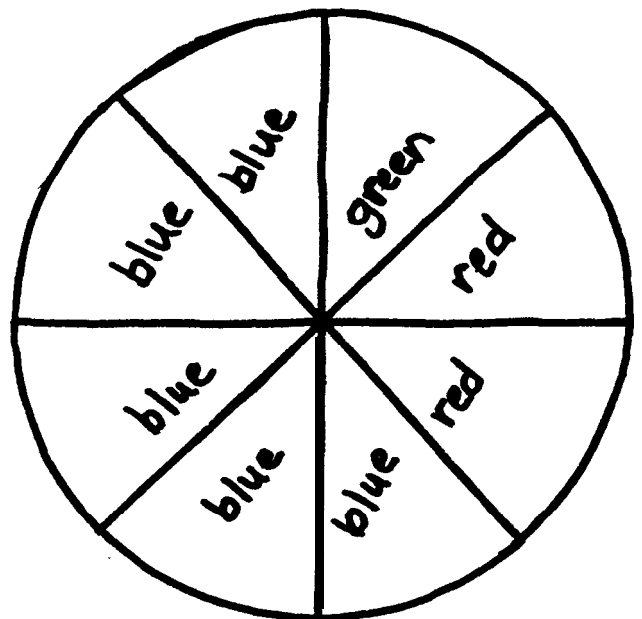
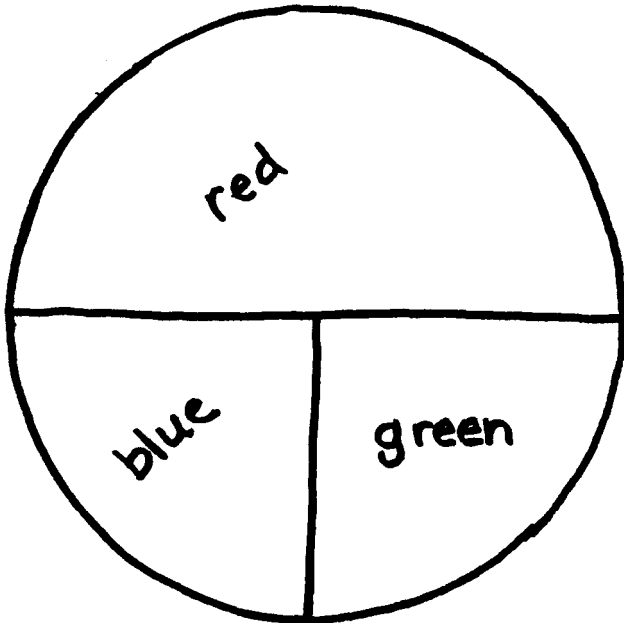
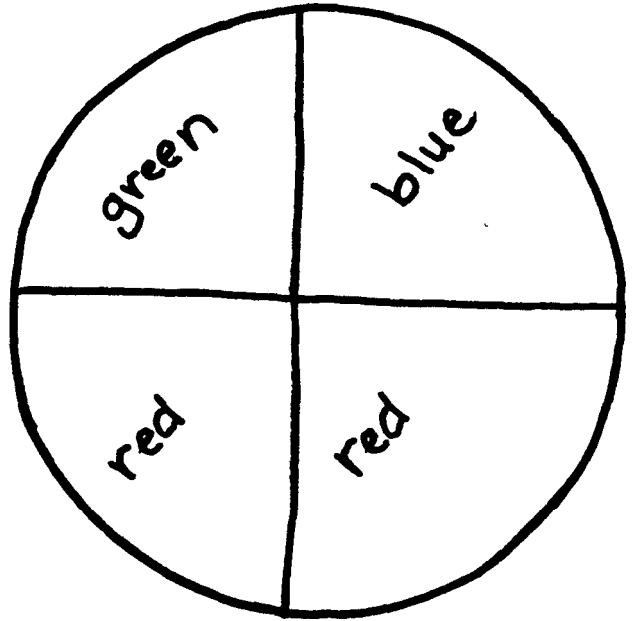
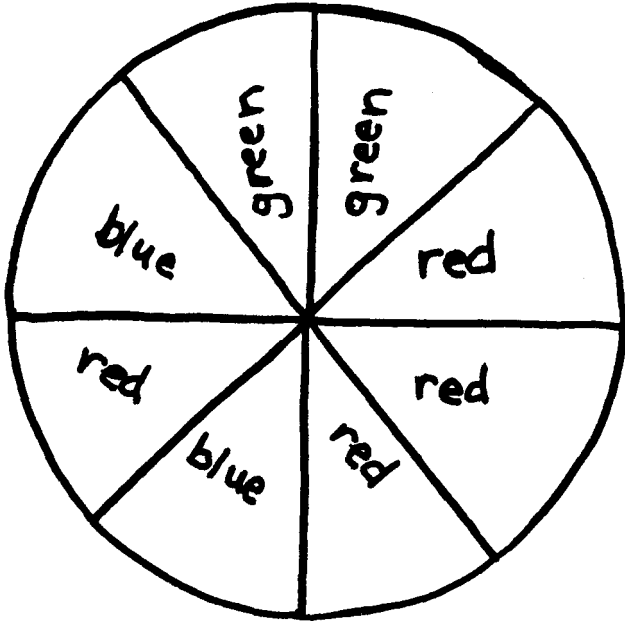
### **Extension/Follow Up:**

1. Art can be integrated into this unit in the form of “glyphs”. Students can collect and organize data as a morning exercise where they will circle their related information before they are able to make their glyph frog. Resource #5 may be used as a guide and teachers may change the form of the questions to accommodate their lessons.
2. Students may prepare a daily bar graph of various frog themes, such as their favorite cartoon frog, their favorite type of frog, or their favorite frog book.
3. Speakers may be brought in from NSA Speakers Bureau, their local expert on frogs, or a zoologist specializing in frogs. Many local zoos have a amphibian exhibit or students may visit their local zoo to explore frogs as a culminating activity.
4. Students may play a game of leapfrog and incorporate collecting data by having them record the lengths of their leaps.
5. Read theme-related books on frogs.
6. Have students draw a spinner which would increase the chances of their friends winning a prize.

**Authors:**

Stacy Cassel  
North East Elementary  
Cecil County, MD

Helen Laruccia  
Overby Sheppard Elementary  
Richmond, VA



Names: \_\_\_\_\_

The state fair has arrived! You and your friend look around and find your favorite game, Freaky Frogs. In order for you to win that huge stuffed frog, you have to spin your frog around 50 times and have it land on the green color at least 25 times. It is up to you and your friend to determine whether or not there is the probability that your frog will win you a prize using the spinner you have been given.

List all the outcomes of your spinner.

**Outcomes:** \_\_\_\_\_

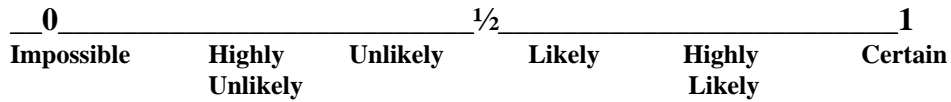
**Our group predicts that out of 50 spins there will be:**

\_\_\_\_\_ of the \_\_\_\_\_ color

\_\_\_\_\_ of the \_\_\_\_\_ color

\_\_\_\_\_ of the \_\_\_\_\_ color

Color	Number of Spins	Total Spins

**Probability Scale****Writing Prompt**

You and your friend are at the state fair and you see the game Freaky Frogs! You want your friend to win that stuffed frog but it is up to you to help your friend decide whether or not to play. You are to use the spinner that was in your group. Do you think your friend should play Freaky Frogs using the spinner that was given? Why or why not? Write a paragraph convincing your friend to play or not to play giving your reasons!

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**Assessment Rubric**

- 1. Paragraph uses probability vocabulary such as likely, certain, unlikely, impossible, etc.**

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<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
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- 2. Student refers to data collected from group graph.**

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<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
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- 3. Student writes a descriptive paragraph providing a reasonable explanation as to why or why not to play the game.**

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<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
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- 4. Student understands the concept of probability.**

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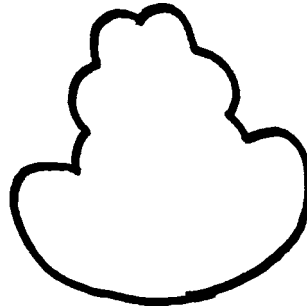
- 5. Student is able to interpret a bar graph and come to a conclusion.**

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<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
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## Frog Glyphs

Possible pattern examples:



<b>Favorite Subject (Eyes)</b>	<b>Math</b> 	<b>Language Arts</b> 	<b>Science</b> 	<b>Social Studies</b> 
<b>Favorite Color (Mouth)</b>	<b>Red</b> 	<b>Blue</b> 	<b>Green</b> 	<b>Yellow</b> 
<b>Month of Birthday (Color of Frog)</b>	<b>January-March</b> yellow	<b>April-June</b> green	<b>July-September</b> red	<b>October-December</b> brown
<b>Favorite Season (Nose)</b>	<b>Fall</b> 	<b>Winter</b> 	<b>Spring</b> 	<b>Summer</b> 
<b>Favorite Activity (Legs)</b>	<b>Swimming</b> 	<b>Watching T.V.</b> 	<b>Riding Bike</b> 	<b>Playing Basketball</b> 